REMARKS/ARGUMENTS

Favorable reconsideration of this application in light of the following discussion is respectfully requested.

Claims 1-14 remain active in this case, Claims 15-20 having been withdrawn from consideration as directed to a non-elected invention.

In the outstanding Official Action, Claims 1-3, 5, 7-10, 12 and 14 were rejected under 35 USC §103(a) as being unpatentable over Horikawa (U.S. Pub 2002/0135030 A1) in view of Shirahata et al (U.S. patent 6,525,380, hereinafter called "Shirahata"). Claims 4, 6, 11, and 13 were rejected under 35 USC §103(a) as being unpatentable over Horikawa in view of Shirahata et al and further in view of Wallace et al. (U.S. patent 6,020,243, hereinafter called "Wallace").

Applicants respectfully disagree with the findings stated in the outstanding Official Action and traverse the outstanding grounds for rejection, because in Applicants' view, the claimed invention clearly patentably defines over the cited references.

More particularly, pending Claim 1 recites:

> 1. A complementary field effect transistor comprising:
> semiconductor substrate;
> **an n-type field effect transistor** provided on the semiconductor substrate having:
> **a first gate insulating film containing an oxide including an element selected from the group consisting of group IV metals and Lanthanoid metals, and further containing a compound of the element and boron**;
> a first gate electrode provided on the first gate insulating film; and
> n-type source and drain regions formed on both sides of the first gate electrode; and
> **a p-type field effect transistor provided on the semiconductor substrate having:**
> **a second gate insulating film containing an oxide including an element selected from the group consisting of group IV metals and Lanthanoid metals, and substantially containing no boron;**
> a second gate electrode provided on the second gate insulating film; and
> p-type source and drain regions provided on both sides of the second gate electrode.
> [Emphasis added]

As stated in Claim 1 the claimed complementary field effect transistor includes n-type and p-type field effect transistors, wherein the gate insulating film of the n-type transistor

contains boron, and the gate insulating film of the p-type transistor contains no boron. This structure is clearly not disclosed or obviated by the cited prior art.

In particular, Horikawa is clearly silent about gate insulating films of transistors including boron, and in fact contains no such teachings.

On the other hand, Shirahata at col. 8, lines 1-4 discloses introducing boron in the gate oxide film of p-channel MOSFET, whereas Claim 1 recites that the gate insulating film of the n-channel transistor contains boron. Further, Shirahata forms negative electric charges (14 in FIG. 15) in a gate oxide film made of silicon oxide ("thermal oxidation" in col. 6, line 14), while present invention forms positive charges in the gate insulating film made of oxide including an element selected from the group consisting of group IV metals and Lanthanoid metals:

As disclosed in Applicants' specification, the claimed structure achieves a result described at page 13, line 23-page 14, line 1 of the specification as follows,

> ... Therefore, it is considered that boron in the Si electrode moves into the gate insulating film, positive charge is generated by the coupling of Hf and boron (B) in the gate insulating film, and this positive charge change the Vfb.

Thus, it is quite clear that the feature of the present invention is neither taught nor render obvious by Shirahata. Indeed, Shirahata describes a different effect of boron forming negative charges in silicon oxide for p-channel MOSFET and Shirahata clearly does not teach or suggest introducing boron into an oxide of group N metals and Lanthanoid metals for n-channel FET in order to form positive charges.

Neither Horikawa nor Shirahata teach or suggest the claimed structure, nor the effects thereby attained. In that regard, attention is directed to page 14, line 1-10 of the specification for a better understanding of the effect of the claimed invention, wherein it is noted:

> ... This is occurred with the mechanism that the gate insulating film is positively charged since the numbers of bonding hands of Hf in group IV elements and that of boron (B) in group III elements are different from each other and one bonding hand of Hf remains unbonded. The threshold values of

two transistors can be made into a suitable value by forming the hafnium-boron (HfB) compound only in the n-type MOSFET and using the same metal for the gate electrodes of two transistors using this phenomenon.

Similarly, pending Claim 8,

Claim 8 A complementary field effect transistor comprising:
a semiconductor substrate;
an n-type field effect transistor provided on the semiconductor substrate **having:**
a **first gate insulating film containing an oxide including an element selected from the group consisting of group IV metals and Lanthanoid metals, and substantially containing no arsenic;**
a first gate electrode provided on the first gate insulating film; and
n-type source and drain regions formed on both sides of the first gate electrode; and
a p-type field effect transistor provided on the semiconductor substrate **having:**
a second gate insulating film containing an oxide including an element selected from the group consisting of group IV metals and Lanthanoid metals, and
further containing a compound of the element and arsenic;
a second gate electrode provided on the second gate insulating film; and
p-type source and drain regions provided on both sides of the second gate electrode. [Emphasis added]

In the complementary field effect transistor of Claim 8, negative charges are formed by incorporating arsenic into the gate insulating film of the p-channel FET. The gate insulating film is made of oxide including an element selected from the group consisting of group IV metals and Lanthanoid metals, and negative charges are formed by incorporating arsenic: Such structure has the effect described at page 16, lines 19-19 of the specification as follows:

... By generating negative charge by incorporating arsenic and hafnium in the gate insulating film 13, the threshold of the p-type MISFET 5 can be appropriately adjusted. As a result, the thresholds of the n-type MISFET 3 and the p-type MISFET 5 may be appropriately balanced.

Once again, Shirahata fails to teach or suggest the claimed features. Boron is group-III element, while arsenic is group-V element. Thus, even if Shirahata were to teach forming

negative charges by incorporating boron into silicon oxide, it clearly does not disclose or suggest forming negative charges by incorporating arsenic into oxide including an element selected from the group consisting of group IV metals and Lanthanoid metals.

The deficiencies of Horikawa and Shirahata are not remedied by the teachings of Wallace, and therefore, it is respectfully submitted that the outstanding grounds for rejection are traversed.

Consequently, in light of the above discussion, it is respectfully submitted that no further issues are outstanding in the present application, and that the present application is in condition for formal allowance. An early and favorable action to that effect is respectfully requested..

Respectfully submitted,

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